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A PREVIEW OF VERMONT'S FOREST RESOURCE

Abstract. Forest land occupies 75 percent of the total land area in Vermont. Nearly one-half of this forest land is the beech-birch-maple forest type. The inventory data show volume increasing but at a lower rate than in neighboring states. This is due to large losses from cull and mortality. Total growing-stock volume is now 4.7 billion cubic feet.

A third inventory of the forest resources of Vermont had been completed by the U. S. Forest Service, Forest Survey. Data from the 1973 inventory along with the earlier inventories of 1948 and 1966 provide a view of the recent history of forest resource changes in Vermont. A detailed statistical and analytical report on the current inventory with an analysis of the trends it reveals is being prepared for publication. This is a preview of that report.

Three of Four Acres Are Forested

Forest land occupies over 75 percent of the total land area in Vermont. Nearly all of the 4.5 million acres of forest land was classified as commercial. About half of this is the maple-beech-birch forest type. White and red pine and spruce-fir are the major softwood types. These two softwood types occupy 32 percent of the forest area. The remaining 21 percent consists of the elm-ash-red maple, aspen-birch, and oak forest types. This distribution shows no major shift in forest-type acreages in the seven years since the last inventory.

The 63.8 thousand acres of noncommercial forest land in 1973 is a 135 percent increase in noncommercial forest land since 1966. Nearly half of this increase was the result of the classification of Christmas tree plantations as productive reserved forest land rather than as commercial forest land. The remainder of this increased acreage was State-owned forest land that was reclassified as productive reserved land by various state resource agencies between 1966 and 1973.

Nearly half of the current commercial forest land is in sawtimber stands. Poletimber stands comprise 22 percent of the area, and seedling and sapling stands make up another 31 percent. The stand sizes shown for 1973 are classified differently from those used in 1966. When the 1973

data were arranged like those of 1966, the following changes in stand size were apparent.

	Percentage of total commercial forest land	
	1966	*1973*
Sawtimber	41	48
Poletimber	35	33
Seedling, sapling	23	18
Nonstocked	1	1
	100	100

A glance at the stand-size distribution by forest types indicates that sawtimber stands comprise a higher-than-average proportion of the area for the white and red pine and maple-beech-birch types.

All of the counties included in the inventory are more than 50 percent forested. Franklin County is the least forested, with 56 percent of the land area in forest. Essex County is nearly 94 percent forested. In the northern counties, softwood types occupy nearly as much acreage as hardwood types. Hardwood types predominate in the southern counties, where they occupy about three times as much area as the softwood types. Essex County has the largest acreage of softwood types, while Windsor County has the largest area in hardwood types.

A study of the owners of private commercial forest land was conducted concurrently with this forest survey. This study revealed that less than one-third of the owners of private commercial forest land have harvested timber from their land. However, these individuals own two-thirds of the private commercial forest area.

Growing-stock Volume Averages Over 1,000 Cubic Feet per Acre

The total volume of growing stock is now 4.7 billion cubic feet. The sawtimber portion totals 9.7 billion board feet. Total growing stock averages 1,068 cubic feet per acre of commercial forest land. This is over 13 cords per acre.[1] The sawtimber portion of the growing stock averages 2,194 board feet per acre. Essex County has the highest average volume per acre—1,212 cubic feet and 2,519 board feet. Franklin County has the lowest average volume per acre—805 cubic feet and 1,547 board feet.

The distribution of growing-stock volume by species has changed very little in the past 7 years. Hardwood volume is still twice softwood volume. Sugar maple is the most prevalent species in the State. It accounts for 23 percent of the total cubic-foot volume of all species. Spruce is the most prevalent softwood, with 11 percent of the total cubic-foot volume. Other important species are red maple, hemlock, white pine, balsam fir, yellow birch, and paper birch. Each of these comprise 6 percent or more of the total cubic-foot volume.

Net Growth is Low

The volume of timber growing on commercial forest land in Vermont has increased during the past 7 years. However, this increase has been considerably less than it might have been had the full growth potential of the forest been realized. The last timber resource report for the State indicated that growth was considerably below potential[2] and the results of this third inventory reinforce this conclusion. As the following data show, Vermont's forest lands have lower annual net growth than those in the rest of New England:

	Vermont	*New England except Vermont*
	Net cubic feet/acre	
Gross growth	41.14	52.26
Cull increment	10.28	6.29
Mortality	6.79	6.21
Net growth	24.07	39.76

Net growth equals gross growth minus cull increment and mortality.

A comparison of growing stock in Vermont with that of the other five New England states shows that gross growth per acre is 21 percent less in Vermont than in the re-

[1]Based on 80 cubic feet of solid wood per standard cord.

[2]Kingsley, N. P. and J. E. Barnard, 1968. The Timber Resources of Vermont, USDA Forest Service Resource Bulletin NE-12, p. 25.

mainder of New England. This is not because of poorer site potential in Vermont but because only 26 percent of the forest land is fully stocked with growing-stock trees. By comparison, in the other New England states between 46 and 59 percent of the commercial forest land is fully stocked. This means that in Vermont there is a smaller growing-stock base on which growth can occur.

A second problem is loss of growing stock to cull increment and mortality. Mortality is the volume of growing-stock trees that have died since the beginning of the measurement period. Cull increment is the volume of trees that were classified as growing stock at the beginning of the measurement period but were of too poor quality at the end of the period to be classed as growing stock. In Vermont the result of these factors was that net growth was only 58 percent of gross growth. In the remainder of New England, net growth was 76 percent of gross growth.

The fact that 25 percent of the gross growth in Vermont is lost because of cull increment points to the need for a major program of timber stand improvement. These cull trees, unlike those lost by mortality, continue to live and occupy valuable growing space in a stand. Their removal and replacement with better quality stems is necessary if net growth is to be increased.

Table 1.—*Land area in Vermont, by county and land classes, 1973*

County	Total land area [a]	Nonforest land area	Forest land area [b]		
			Noncommercial [c]	Commercial	
	Thousand acres				*Percent*
Addison	501.5	209.2	6.5	285.8	57
Bennington	430.2	54.1	5.4	370.7	86
Caledonia	391.9	96.3	4.3	291.3	74
Chittenden	341.1	127.9	17.5	195.7	57
Essex	424.5	27.2	1.2	396.1	93
Franklin	422.7	184.6	1.2	236.9	56
Grand Isle	53.3	53.3	—	—	—
Lamoille	303.6	49.2	3.2	251.2	83
Orange	441.7	105.3	.5	335.9	76
Orleans	457.4	118.3	.1	339.0	74
Rutland	593.3	139.3	9.1	444.9	75
Washington	452.8	86.8	4.7	361.3	80
Windham	503.6	72.1	3.0	428.5	85
Windsor	617.8	118.1	7.1	492.6	80
Total	5,935.4	1,441.7	63.8	4,429.9	75

[a] Source: Area Measurement Report, Bureau of the Census, Areas of Vermont: 1960, (January, 1967).
[b] Except where noted otherwise, all tables include data for the Green Mountain National Forest.
[c] Includes unproductive and productive reserved forest land.

Table 2.—*Number and area held by private owners of commercial forest land, by form of ownership and timber harvest activity, Vermont, 1973*

Form of ownership	All owners		Owners who have harvested timber	
	Number	*Thousand acres*	*Number*	*Thousand acres*
Individual	73,891	2,935.6	20,234	1,709.1
Partnership	195	48.3	31	19.3
Corporation	714	859.5	629	791.9
Other [a]	2,509	144.9	2,140	115.9
Total	77,309	3,988.3	23,034	2,636.2

[a] Includes associations, clubs, and undivided estates.

Table 3.—*Area of commercial forest land, by forest types and size classes, Vermont, 1973*

(In thousands of acres)

Forest type	All stands	Saw-timber stands	Pole-timber stands	Sapling-seedling stands	Nonstocked areas
White and red pine	650.1	437.7	45.2	156.9	10.3
Spruce-fir	784.4	178.3	224.1	372.7	9.3
Oak-pine	85.3	30.9	19.4	35.0	—
Oak-hickory	70.9	42.7	28.2	—	—
Elm-ash-red maple	504.9	180.5	118.2	196.0	10.2
Maple-beech-birch	2,082.4	1,143.7	436.2	502.5	—
Aspen-birch	251.9	47.2	83.2	113.4	8.1
All types	4,429.9	2,061.0	954.5	1,376.5	37.9

Table 4.—*Area of commercial forest land in Vermont, by county and forest type, 1973*

County	Softwood types	Hardwood types	All types	Sampling error of total[a]
	Thousand acres			*Percent*
Addison	69.5	216.3	285.8	16
Bennington	78.1	292.6	370.7	3
Caledonia	124.5	166.8	291.3	8
Chittenden	56.4	139.3	195.7	14
Essex	147.3	248.8	396.1	2
Franklin	112.7	124.2	236.9	15
Lamoille	95.5	155.7	251.2	5
Orange	140.2	195.7	335.9	7
Orleans	142.0	197.0	339.0	8
Rutland	104.5	340.4	444.9	7
Washington	137.1	224.2	361.3	6
Windham	103.1	325.4	428.5	4
Windsor	123.6	369.0	492.6	6
Total	1,434.5	2,995.4	4,429.9	2

[a]For total commercial forest land at the 68 percent probability level.

Table 5.—*Annual net growth and removals of growing stock and sawtimber on commercial forest land, by species groups, Vermont, 1972*

Species groups	Growing stock		Sawtimber	
	Net growth	Removals	Net growth	Removals
	Thousand cubic feet		*Thousand board feet*[a]	
Softwoods	46,500	19,400	129,000	52,000
Hardwoods	60,100	28,400	133,000	66,000
Total	106,600	47,800	262,000	118,000
	Percent			
Sampling error of totals	9	29	13	29

[a]International ¼-inch rule.

Table 6.—*Net volume of growing stock on commercial forest land in Vermont, by county and species group, 1973*

County	Softwoods	Hardwoods	Total	Sampling error of total
	Million cubic feet			*Percent*
Addison	68.7	207.8	276.5	9
Bennington	99.2	300.7	399.9	7
Caledonia	148.7	153.6	302.3	9
Chittenden	53.8	135.2	189.0	13
Essex	212.7	267.3	480.0	7
Franklin	98.5	92.3	190.8	13
Lamoille	129.2	163.4	292.6	10
Orange	162.9	189.5	352.4	9
Orleans	170.3	194.8	365.1	9
Rutland	119.3	343.5	462.8	7
Washington	176.5	228.3	404.8	8
Windham	127.0	346.3	473.3	7
Windsor	151.2	389.5	540.7	7
Total	1,718.0	3,012.2	4,730.2	2

Table 7.—*Net volume of growing-stock trees*[a] *on commercial forest land, by species and tree size, Vermont, 1973*

Species	All trees	Poletimber trees	Sawtimber trees	
		Million cubic feet		*Million board feet*[b]
Spruce	532.3	245.1	287.2	1,142.0
White and red pine	387.1	125.6	261.5	1,070.4
Hemlock	378.6	114.6	264.0	1,050.6
Balsam fir	337.7	210.7	127.0	485.3
Other softwoods	82.3	48.7	33.6	127.2
Total softwoods	1,718.0	744.7	973.3	3,875.5
Sugar maple	1,083.2	528.4	554.8	2,325.4
Red maple	450.3	265.3	185.0	744.5
Yellow birch	331.7	156.4	175.3	736.5
Paper birch	282.1	199.7	82.4	333.2
Beech	236.3	100.7	135.6	561.4
Ash	181.3	105.8	75.5	305.6
Aspen	135.2	97.3	37.9	153.7
Select red oaks	113.1	37.4	75.7	315.0
Other hardwoods	199.0	108.5	90.5	369.9
Total hardwoods	3,012.2	1,599.5	1,412.7	5,845.2
All species	4,730.2	2,344.2	2,386.0	9,720.7

[a]Growing stock trees are trees that satisfy national specifications for form and cull. Net volumes are given for all such trees 5.0 inches dbh and larger.
[b]International ¼-inch rule.

Table 8.—*Net volume of sawtimber on commercial forest land in Vermont, by county and species group, 1973*

County	Softwoods	Hardwoods	Total	Sampling error of total
	—— *Million board feet*[a] ——			*Percent*
Addison	166.7	405.3	572.0	12
Bennington	251.2	574.8	826.0	9
Caledonia	314.8	307.8	622.6	13
Chittenden	137.6	243.7	381.3	18
Essex	456.4	541.3	997.7	10
Franklin	187.2	179.3	366.5	17
Lamoille	274.4	330.3	604.7	14
Orange	334.1	379.8	713.9	13
Orleans	358.4	392.5	750.9	13
Rutland	301.5	649.7	951.2	10
Washington	370.4	465.7	836.1	11
Windham	331.9	643.1	975.0	10
Windsor	390.9	731.9	1,122.8	10
Total	3,875.5	5,845.2	9,720.7	3

[a] International ¼-inch rule.

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